



CANADIAN PETROLEUM ASSOCIATION
PIPELINE DIVISION

OIL PIPELINE PERFORMANCE REVIEW

1990

CANADIAN PETROLEUM ASSOCIATION

PIPELINE DIVISION

OIL PIPELINE PERFORMANCE REVIEW

1990

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**CANADIAN PETROLEUM ASSOCIATION
1990 OIL PIPELINE PERFORMANCE REVIEW**

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1990 OIL PIPELINE PERFORMANCE REVIEW

EXECUTIVE SUMMARY

A. GENERAL OVERVIEW

- No injuries or deaths were associated with 1990 failures.
- The number of failures (36) was down 16% from 1989.
- Equipment failures (47%), corrosion (22%) and field operational error (19%) remain the major cause of failures.
- Repair, damage and clean-up costs were considerably higher this year at \$5,302,000 of which one external corrosion failure contributed \$4,500,000.
- The industry recovered 2 604 m³ of the 4 684 m³ spilled. Of the 2 080 m³ lost, the above external corrosion failure accounted for 1 725 m³.
- Spillage due to equipment failures and field operational errors is largely recovered as it occurs mainly in controlled areas such as tank farms, terminals and pump stations.
- Two of the 36 failures were detected by some form of leak detection.

B. HIGHLIGHTS

(i) Performance

- Thirty-one companies participated in 1990 involving 73 pipeline systems with 34 907 km of line transporting 235×10^6 m³ of product.

(ii) Failures

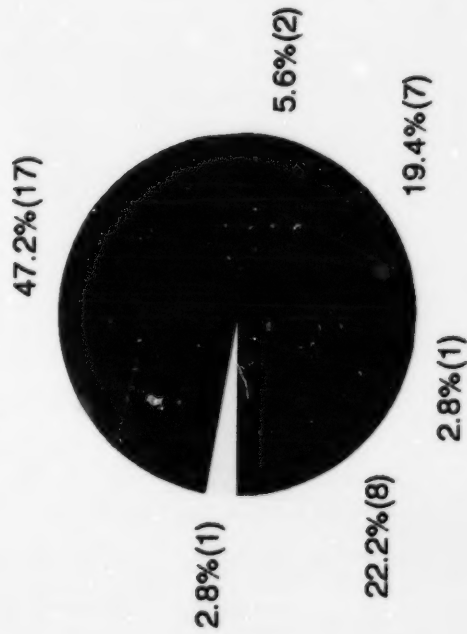
- Thirty-six failures were reported in 1990.
- Thirty-four failures were detected by employees and third parties on site.
- Two failures were detected by leak detection methods. One by manual material balance and the other by pressure monitoring.
- Two failures occurred in HVP systems due to equipment failure and resulted in 5.0 m³ of lost product.
- Two failures and one fire occurred in a refined products system resulting in 0.3 m³ lost product.
- Bacterial corrosion and acid attack appear to be a recurring problem in crude oil systems.
- 1990 failures resulted in two minor fires with no damage. There were no deaths, explosions or injuries.

EXHIBIT 1

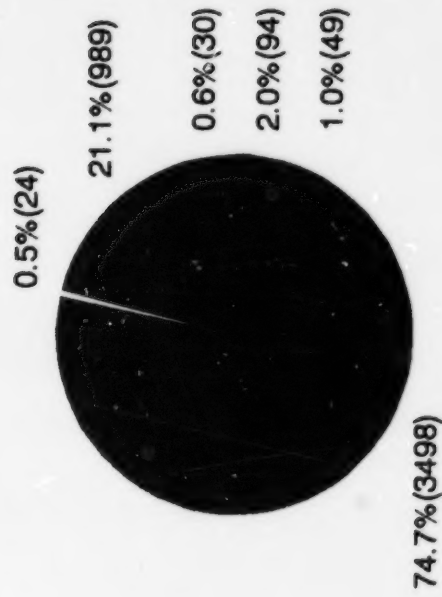
***1990 OIL PIPELINE PERFORMANCE REVIEW
SUMMARY OF FAILURES***

CANADIAN PETROLEUM ASSOCIATION 1990 OIL PIPELINE PERFORMANCE REVIEW SUMMARY OF FAILURES

FAILURES
(#)



VOLUMES
(M*3)



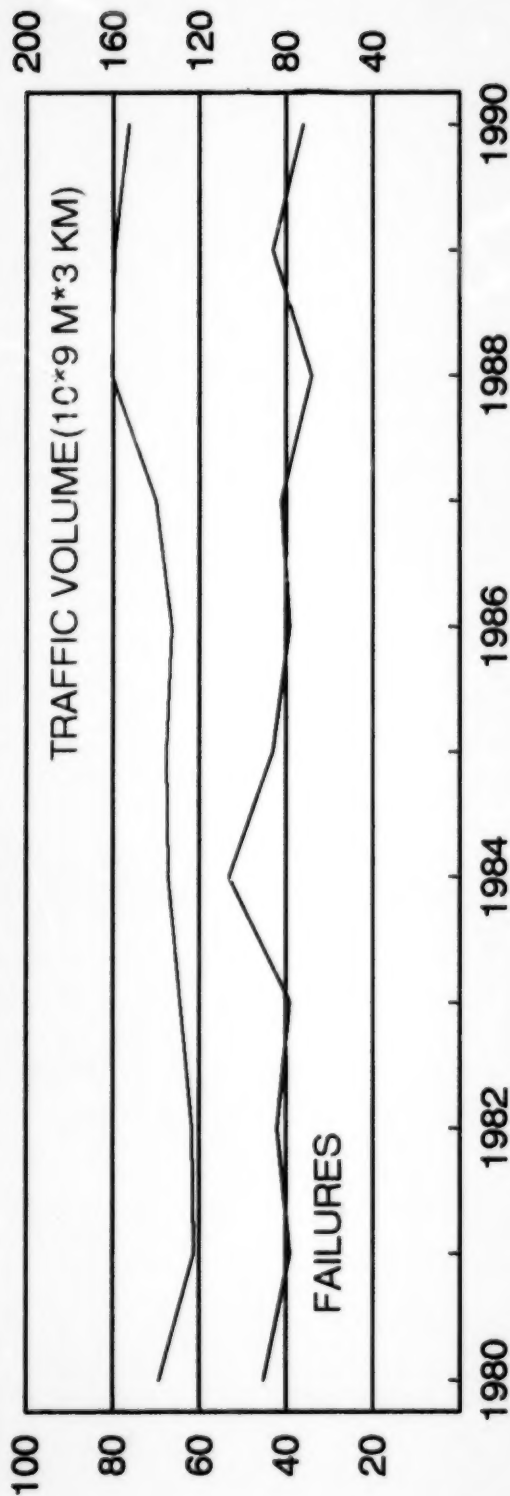
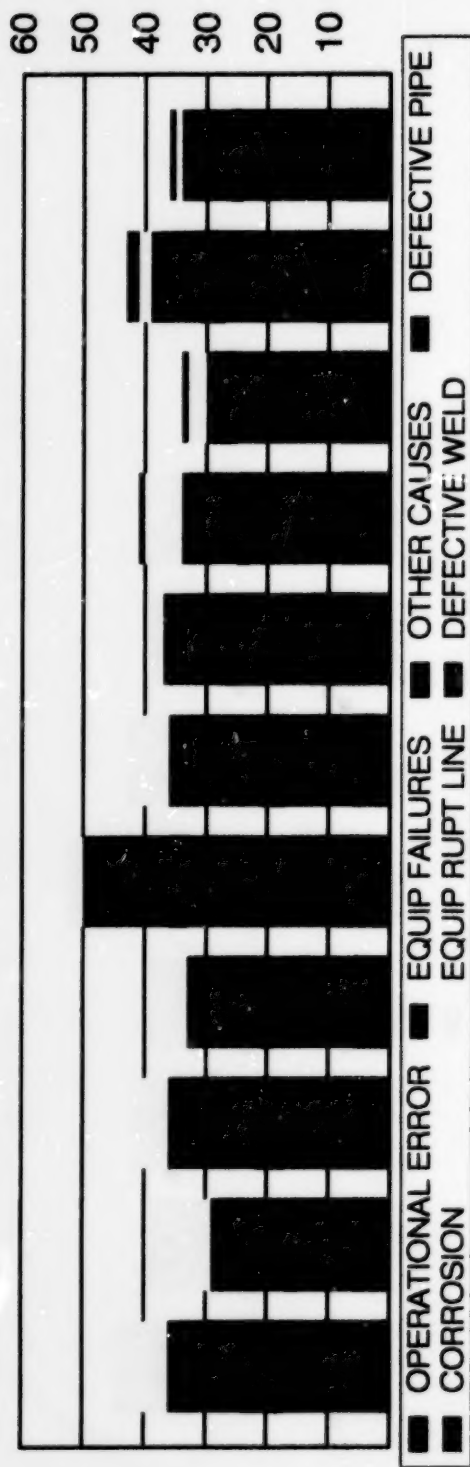
- EQUIP FAILURE
- EQUIP RUPT LINE
- CORROSION
- DEFECTIVE WELD
- OPERATIONAL ERROR
- OTHER CAUSES

EXHIBIT 2

***1990 OIL PIPELINE PERFORMANCE REVIEW
HISTORICAL SUMMARY OF FAILURES***

1990 OIL PIPELINE PERFORMANCE REVIEW

HISTORICAL SUMMARY OF FAILURES



CANADIAN PETROLEUM ASSOCIATION 1990 OIL PIPELINE PERFORMANCE REVIEW

1.0 INTRODUCTION

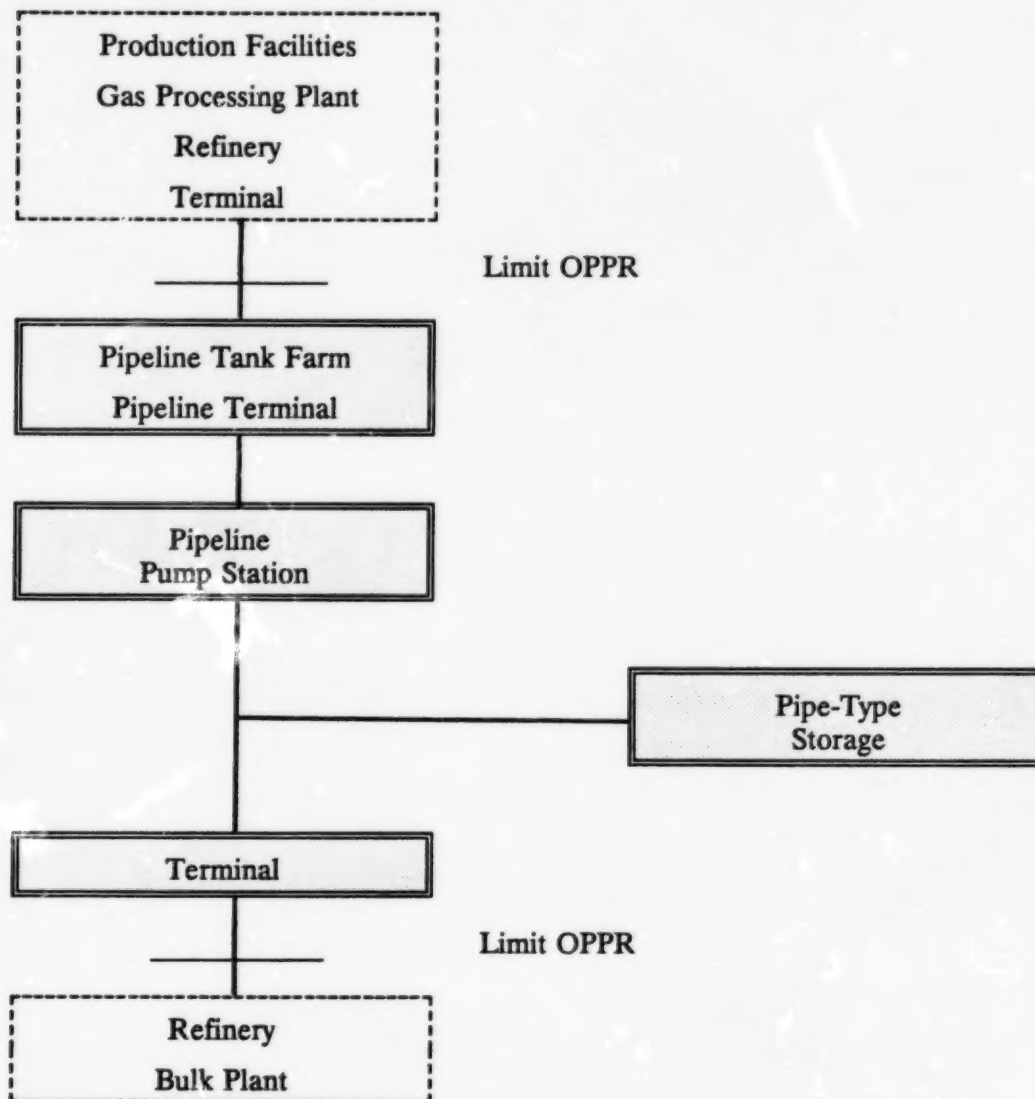
All liquid hydrocarbon pipelines in Canada, including crude oil, refined products and High Vapour Pressure (HVP) lines are requested to participate in this industry analysis by submitting voluntary, confidential performance and failure reports. The majority of these pipeline systems are represented by the Canadian Petroleum Association (CPA).

Pipelines included in this review fall within the scope of CAN3-Z183-M86, Oil Pipeline Transportation Systems. However, only oil lines and high vapour pressure pipelines downstream of production facilities and refined petroleum product lines are covered. Multi phase lines, producer operated pipelines and flow lines now included in CAN3-Z183-M86 are not covered. This scope is shown diagrammatically in Exhibit 3.

All data for the review was collected by CPA on two standard forms. Samples of the Oil Pipeline General Data Report and the Oil Pipeline Failure Report are included in Appendix B. Incidents resulting in a spill of 1.5 m³ or more of oil, or any amount of HVP material, and any incident involving an injury, a death, a fire, or an explosion are classified as reportable.

Care must be exercised in any attempt to apply or compare statistics included in this review to any particular pipeline system or regulatory jurisdiction. They have been generated on the basis of submissions from a wide variety of pipelines, including gathering systems.

CANADIAN PETROLEUM ASSOCIATION
1990 OIL PIPELINE PERFORMANCE REVIEW
SCOPE



NOTE: Only facilities and pipelines indicated by shading are within the scope of the CPA Oil Pipeline Performance Review.

2.0 PERFORMANCE REVIEW

Seventy-three participating Canadian oil pipeline systems submitted reports for the 1990 operating year. These systems represent the majority of the industry and include all major oil pipeline systems. The statistics in this review are, therefore, considered to be representative of the Canadian industry.

2.1 1990 SUMMARY

There were no injuries or fatalities associated with the 36 reported incidents.

It should be noted that 12 of the 36 reported incidents were associated with line pipe or fittings thereon; the remaining 24 incidents occurred at pump stations, tank farms or delivery points. Eight of the line pipe failures resulted from corrosion - six of which were internal corrosion. Bacterial corrosion and acid attack appear to be a recurring cause of internal corrosion.

These corrosion problems are significant in that the volume released is often high. In 1990, these eight corrosion failures accounted for 75% (3498 m³) of the total volume released.

The 24 incidents reported at tank farms, pump stations and delivery points resulted largely from equipment failures (17) and minor operational errors (7), with relatively minor property damage. The type of failures which appear to be somewhat repetitive are the failure of pump packings, gaskets and cracked nipples.

The average spill size in 1990 was 130 m³ with 72 m³ being recovered on average for a 55.4% recovery rate.

The dramatic increase in clean-up costs can be largely attributed to one major spill which accounted for almost 90% of the total costs.

Detection of the 36 reported failures was as follows:

By -		
Pipeline Employee	19	
Outside Party	15	
Leak Detection System	2	- one based on weekly manual balance - one shut down based on low station discharge pressure

2.2 1990 VS. 1989 - PERFORMANCE COMPARISON

The following table compares 1990 performance statistics with the previous year:

	1990	1989	% CHANGE
No. of Systems Reporting	73	69	
No. of Failures Reported	36	43	-16.3
Length of Line In Service - km	34 907	34 493	+ 1.2
Delivery Volume x 10^6 m ³	235	233	+ 0.9
Traffic Volume x 10^9 m ³ /km	153	159	- 3.8
Total Volume Released - m ³	4 684	5 490	-14.7
Volume Recovered - m ³	2 604	3 644	-28.5
Volume Lost - m ³	2 080	1 846	+ 12.7
Clean-Up Costs - K\$	5 028	1 315	+282.4
Property Damage - K\$	274	456	-39.9
Injuries	0	1	-
Fatalities	0	0	-

The magnitude of some of these values may be better understood by considering the following:

- Length of Line in Service: 34 907 km
Equates to 10 parallel lines from Calgary to Toronto.
- Delivery Volume: 235×10^6 m³
Equates to 40,488 tandem truck loads per day.
- Traffic Volume: 153×10^9 m³/km
Equates to running 12.7 unit trains per day from Calgary to Toronto.

2.3 HISTORICAL COMPARISON

An 11 year statistical summary of oil pipeline performance data is presented in Exhibit 4.

Key observations taken from this 11 year history are:

- The number of reporting systems showed a steady growth until 1985. Since that time, all major systems have been reporting regularly. Variations in the number from year to year generally reflect a change in the operating strategy of companies or the addition of new small systems.
- While length of line, traffic volume and the number of failures have remained relatively constant over this 11 year span, spill size and associated data such as costs and recovered volumes appear to vary considerably depending on the circumstances of one or two major failures each year.

A comparison of 1990 data to the 10 year average is provided in the table below.

	1990	PREVIOUS 10 YEAR AVERAGE	% CHANGE
Pipeline Systems Reporting	73	64	
Length of Line in Service - km	34 907	31 629	+ 10.4
Delivery Volume x 10^6 m ³	235	221	+ 6.3
Traffic Volume x 10^9 m ³ /km	153	137	+ 11.7
No. of Failures	36	42	- 14.3
Volume Released - m ³	4 684	5 453	- 14.1
Volume Recovered - m ³	2 604	2 064	+ 26.2
Repair/Clean-Up Costs - K\$	5 302	1 475	+259.5
Injuries	0	1.9	-
Deaths	0	0.3	-

**CANADIAN PETROLEUM ASSOCIATION
1990 OIL PIPELINE PERFORMANCE REVIEW STATISTICAL SUMMARY**

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	10-YEAR AVERAGE	1990
Number of Pipeline Systems Reporting	53	53	61	61	65	66	70	70	73	69	64	73
Length of Line in Service - km	29785	29650	30308	30439	30615	30905	32617	33621	33856	34493	31629	34907
Delivery Volume x 10 ⁶ m ³	235.7	214.9	211.6	204.4	215.3	211.6	219.0	230.5	243.2	232.9	221.9	235.0
Traffic Volume x 10 ⁹ m ³ km	138.5	122.6	123.1	128.7	134.1	135.0	132.6	140.0	160.1	159.5	137.4	152.5
Number of Failures	45	39	42	39	53	43	39	41	34	43	42	36
Failures/10 ³ km	1.5	1.3	1.4	1.3	1.7	1.4	1.2	1.2	1.0	1.2	1.3	1.0
Failures/10 ⁹ m ³ km	0.33	0.33	0.34	0.30	0.39	0.32	0.29	0.29	0.21	0.30	0.31	0.24
Volume Spilled - m ³	8511	2377	6537	7450	6171	10738	2055	3977	1224	5490	5453	4684
Volume Loss - m ³	5931	1427	3531	6038	2982	7830	654	3154	496	1846	3389	2080
Average Spill Size - m ³	189	61	156	196	116	250	53	97	36	128	128.2	130
Largest Spill Size - m ³	6061	516	1365	1589	1994	3800	320	2800	284	3136	6061	2300
Injuries Resulting from Failures	0	0	2	4	2	5	4	1	0	1	1.9	0
Deaths Resulting from Failures	0	0	0	1	0	2	0	0	0	0	0.3	0
Repair, Damage and Spill Clean-up Costs k\$ **	1254	634	1320	2721	953	2533	794	1005	1768	1771	1475	5302

- * Not all volumes move total system length
- ** Does not include cost of product lost due to failure.

2.4 COMPARISON BY JURISDICTION

Failures were reported in five provinces during 1990, distributed as follows:

	<u>1990</u>	<u>1989</u>
Alberta	22	25
Saskatchewan	8	10
Ontario	3	4
Manitoba	2	3
British Columbia	1	0
N.W.T.	0	1

A further assessment of performance of the Canadian pipeline industry is to review the information of this report with statistics on pipelines in other jurisdictions. Information on pipelines in the United States and Europe is available through the U.S. Department of Transportation (D.O.T.), and the Oil Companies International Study Group for Conservation of Clean Air and Water - Europe (CONCAWE).

The most recent statistics available from these jurisdictions, at this time, are for the year 1988. This offset is not expected to lessen the value of the review as the statistics do not seem to change significantly on an annual basis.

A summary of Canadian statistics and those of Western Europe and the U.S.A. are shown in the tables below. A direct comparison of these numbers should not be used, because of the different reporting parameters in the various jurisdictions, although they are useful for focusing on common problems.

	<u>Canada</u> <u>1990</u>	<u>Western Europe</u> <u>1988</u>	<u>U.S.A.</u> <u>1988</u>
Length of Line - km	34 907	17 700	250 000
No. of Failures	36	11	196
Failures / 10^3 km	1.0	0.6	0.8
Traffic Volume x 10^9 m ³ /km	153	91	n/a
Delivery Volume x 10^6 m ³	235	538	n/a
Volume Released - m ³	4 684	1 193	34 408
Volume Recovered - m ³	2 604	441	n/a
Recovery Rate	55.7%	37.0%	n/a

<u>Cause of Failure</u>	<u>Canada</u>	<u>No. of Failures Western Europe</u>	<u>U.S.A.</u>
Corrosion	8	3	53
Operational Error	7	-	13
Equipment Failure	17	1	7
Third Party Damage	1	6	55
Defective Weld	1	-	6
Defective Pipe	-	-	11
Other	<u>2</u>	<u>1</u>	<u>51</u>
	36	11	196

Corrosion is probably the most common cause for concern in all three reports.

The Canadian industry would appear to have gained control of the third party damage problem to a far greater extent than either of the other two jurisdictions.

Operational error and equipment failure are cause for concern within the Canadian industry. However, the quoted numbers in the comparison tables are felt to be a reflection of the different reporting requirements and an indication of the types of facilities which are included in the three reports. This is true in that the European operations do not generally include gathering systems, whereas the U.S. reporting requirements would exclude most of the Canadian operational error and equipment failures based on size and cost.

3.0 FAILURE SUMMARY

3.1 HIGHLIGHTS

A total of 36 failures were reported in 1990, which is down from the 43 failures reported in 1989, and the 10 year average of 42. Failures were distributed as follows:

Nine Systems	-	1	Failure
Three Systems	-	2	Failures
Two Systems	-	3	Failures
One System	-	7	Failures
One System	-	8	Failures

Exhibit 5 provides a summary of 1990 failure categories.

Exhibit 6 provides additional details for each failure category. There were two minor fires in 1990 with no injuries or damage reported. One fire was a result of an electrical storm and the other was due to operational error during maintenance work. There were no explosions associated with the failures reported in 1990.

Fifty three percent of the failures were detected by pipeline employees, 42% by outside parties, and 5% by leak detection systems*.

There were two minor HVP failures where minimal product was released. One failure was due to a small leak in a buried check valve located at a pump station. The other was due to a failed packing gland on a pump unit.

* For the purpose of this report the definition of leak detection systems includes material balance systems, and/or any other mechanical or electronic means which would detect the possibility of a leak and initiate a response.

3.2 1990 VS TEN YEAR AVERAGE

SUMMARY OF FAILURES

	<u>1990</u>	<u>Previous 10 Year Average</u>
EQUIPMENT FAILURES	17	13
EQUIPMENT RUPTURING LINE	1	5
CORROSION - Internal	6	7
- External	2	-
OPERATIONAL ERROR	7	8
DEFECTIVE PIPE	0	4
DEFECTIVE WELD	1	0.4
NATURAL HAZARD	1	0.6
OTHER	<u>1</u>	<u>4</u>
TOTAL	36	42

**CANADIAN PETROLEUM ASSOCIATION
1990 OIL PIPELINE PERFORMANCE REVIEW
LIST OF FAILURES BY CATEGORY**

	<u>LVP</u>	<u>HVP</u>	<u>TOTAL</u>
EQUIPMENT FAILURES			
Gasket	4	1	5
Nipples	3	-	3
Packing	2	1	3
Tank mixer seal	1	-	1
Switch	1	-	1
Tank Gauge	3	-	3
Dresser sleeve	1	-	1
Valves	-	-	0
	<u>15</u>	<u>2</u>	<u>17</u>
EQUIPMENT RUPTURING LINE			
Contract Equipment	1	-	1
CORROSION			
External	2	-	2
Internal	<u>6</u>	-	<u>6</u>
	<u>8</u>	<u>0</u>	<u>8</u>
OPERATIONAL ERROR			
Valve not Closed	1	-	1
Overfilling	2	-	2
Miscellaneous	2	-	2
Overpressure Piping	<u>2</u>	-	<u>2</u>
	<u>7</u>	<u>0</u>	<u>7</u>
DEFECTIVE PIPE	<u>0</u>	<u>0</u>	<u>0</u>
DEFECTIVE WELD			
Weld on tank floor	1	0	1
OTHER			
Natural Hazard	1	-	1
Pipe Previously Damaged	0	-	0
Other	<u>1</u>	-	<u>1</u>
	<u>2</u>	<u>0</u>	<u>2</u>
TOTAL	<u>34</u>	<u>2</u>	<u>36</u>

CANADIAN PETROLEUM ASSOCIATION
1990 OIL PIPELINE PERFORMANCE REVIEW
FAILURE STATISTICS

NUMBER OF FAILURES									
	Equipment Failure 17	Equipment Rupturing Line 1	Corrosion		Operational Error 7	Defective Pipe 0	Defective Welds 1	Other 2	Total 36
FAILURE LOCATION									
- Line Pipe	3	1	2	6	-	-	-	-	12
- Pump Station	9	-	-	-	3	-	-	2	14
- Tank Farm	4	-	-	-	1	-	1	-	6
- Delivery Point	1	-	-	-	3	-	-	-	4
DETECTION METHOD									
- Outside Party	7	-	1	5	2	-	-	-	15
- Pipeline Employee	10	-	-	1	5	-	1	2	19
- R.O.W. Surveillance	-	-	-	-	-	-	-	-	0
- Leak Detection	-	1	1	-	-	-	-	-	2
FAILURE IMPACT									
- Injuries	-	-	-	-	-	-	-	-	0
- Fires	-	-	-	-	-	-	-	2	2
- Explosions	-	-	-	-	-	-	-	-	0
- Area Damaged (hectares)	6.2	0	24	4.3	0.2	-	-	0.4	30.1
- Costs (K\$)*	242	10	4 588	352	38	-	57	15	5 302
- Clean-up Time (days)	41	1	91	84	25	-	15	4	261
- Shutdown Time (days)	9.1	1	10	11.3	0.2	-	-	0.3	31.9
SPILL VOLUME (m ³)									
- Released	989	24	2 345	1 153	94	-	49	30	4 684
- Reclaimed	937	16	575	913	87	-	47	29	2 604
- Lost	52	8	1 770	240	7	-	2	1	2 080
COMMODITY RELEASED									
- Crude Oil	15	-	1	4	6	-	1	1	28
- Condensate	-	1	1	2	-	-	-	-	4
- Refined Products	-	-	-	-	1	-	-	1	2
- HVP	2	-	-	-	-	-	-	-	2
* Repair, Damage, and Clean-Up Costs only									

* Repair, Damage, and Clean-Up Costs only

**CANADIAN PETROLEUM ASSOCIATION
1990 OIL PIPELINE PERFORMANCE REVIEW
FAILURE DETAILS**

Failures have been arranged into 6 categories as indicated in Exhibits 4, 5, and 6. Details of each failure category are as follows:

1. EQUIPMENT FAILURE

This category accounted for seventeen of the failures in 1990 (47%), an increase of four when compared to the 10 year average. There were 14 failures reported at pump stations, tank farms, and delivery point facilities, and 3 failures reported on pipelines.

This category accounted for 989 m³ of the total spill volume (21%) and crude oil was the predominant product spilled. There was a 6 m³ release of NGL which was due to a failed packing gland on a pump unit.

The equipment failures were generally minor with failures such as cracked threaded nipples, leaking gaskets, and failed packing glands accounting for 11 of the 17 failures. There were three faulty tank gauges that caused storage tanks to overflow. The other three failures were due to a pressure switch malfunction, a leaking tank mixer seal, and a buried dresser coupling that pulled apart.

There was minimal property damage caused by the equipment failures with a total of 1.2 hectares being affected. One leak accounted for 83% of the area damaged.

The most significant failures for this category are highlighted as follows:

- (i) There were three incidents where a faulty tank gauge caused the storage tank to overflow. A total of 705 m³ of crude oil was spilled, however 95% of the spilled volume was recovered.
- (ii) A seal on a tank mixer failed and caused 72 m³ of crude to spill. All but 1 m³ of product was recovered.
- (iii) A nipple on lubricating piping for a buried block valve cracked and released 66 m³ of crude (64 m³ recovered).

- (iv) A failed packing gland on a pump unit caused a release of 32 m³ of crude oil, of which 31 m³ was recovered.

2. EQUIPMENT RUPTURING LINE

There was one failure in this category which is a significant decrease from last year (5) and the 10 year average of 5. This failure occurred on line pipe but in close proximity to a delivery point facility.

This failure was a result of a fencing contractor striking the pipeline with a post hole auger. This contractor was working for a third party and there was no agreement in place for the third party to cross the pipeline right-of-way.

This failure resulted in a release of 24 m³ of condensate, of which 16 m³ (67%) was recovered.

3. CORROSION

EXTERNAL

This category accounted for two of the failures in 1990 (5%). Both of these failures occurred in the pipeline.

This category accounted for 2 345 m³ of the total 1990 spill volume (50%). One of the failures caused 2 300 m³ of crude oil to be released while the other involved a release of 45 m³ of condensate.

The 2 300 m³ spill occurred in a muskeg area of central Alberta and caused damage over a 24 hectare area. A significant clean-up effort was required that involved 56 days to complete and \$4,500,000 in expenditures.

The cause of the failure was determined to be stress corrosion cracking.

The other failure occurred on a pipeline river crossing and was attributed to pin hole external corrosion. A new river crossing was installed to replace the existing pipeline and the company was unable to retrieve the failed line pipe as it was installed with a bundle of lines that were installed in a common ditch.

The company reported that there was minimal area damaged and no shore line damage was noted along the banks of the river. None of the spilled volume was recovered.

INTERNAL

Internal corrosion resulted in six failures in 1990 (17%) which is an increase of three from 1989 and comparable to the 10 year average of seven. The pipeline was found to be the origin of spill in all of the failures.

This category accounted for 1 153 m³ of the total spill volume (25%) and crude oil was the predominant product spilled (1 123 m³). Condensate was the other product spilled. Approximately 80% of the spilled product was later recovered.

Four of the corrosion failures were a result of sulphate reducing bacteria being present in the product. This bacteria problem caused failures in three different pipeline systems. The other two failures occurred in one pipeline system and were found to be pin hole leaks. A metallurgical examination of the line pipe determined carbonic acid was the cause of the corrosion.

4. OPERATIONAL ERROR

There were 7 failures reported that were a result of operational error (19%), a decrease of five from last year and comparable to the 10 year average of 8.

All of the operational errors were attributed to employees working in the field at various pump stations or terminal facilities. There were no failures caused by control centre operators who remotely monitor and control the pipeline system.

All 7 of the failures occurred at pump stations, tank farms, or delivery point facilities. A total of 94 m³ of product was spilled because of operational error, however, 93% of those volumes were recovered. Crude oil was the product released except for a 1.5 m³ spill which involved a refined product (gasoline).

Five of the leaks occurred in the vicinity of storage or sump tanks. The other two leaks occurred at pig traps.

There were two spills that resulted from valves being left open. Another three failures occurred as a result of valves being closed which in turn lead to an overpressure situation that caused equipment to fail or a sump tank to overflow. The other two incidents were a result of the employee not following proper operating procedures during maintenance activities.

The most significant failures for this category are highlighted as follows:

- i) Sparks from a grinder ignited vapours within a sump tank and drainline which resulted in a fire. There were no injuries or property damage reported.
- ii) A section of line was left isolated and the heat of the sun lead to thermal expansion in the section. The lid of a check valve was overpressured and failed and caused the release of 29 m³ of crude (over 97% was later recovered).
- iii) A valve to a delivery tank was shut in which overpressured the piping upstream. This overpressure caused the failure of an O-ring in a strainer. 28 m³ of crude was spilled, all but 2.5 m³ was recovered.
- iv) An operator failed to replace the O-ring on a pig trap after a pig had been launched. Oil leaked through the closure and 25 m³ of crude was spilled. All of the crude was later recovered.

5. DEFECTIVE WELDS

There was one defective weld in 1990. A crack developed on a fillet weld that was made to secure a strap to a storage tank floor plate. The cracked weld lead to the release of 49 m³ of crude (47 m³ later recovered).

6. OTHER

There were two failures attributed to "other" causes. One failure was due to a natural hazard (electrical storm), while the other was due to stress on the piping.

Excessive stress caused a weld on a 90° elbow to crack which resulted in a crude oil spill of 30 m³. A total of 29 m³ was later recovered.

A lightning strike lead to a failed O-ring in an insulating union. This in turn caused product to seep which subsequently caught fire. The personnel on site observed the fire and immediately extinguished it. There were no injuries or property damages as a result of the fire. The source of ignition was suspected to be high ground current resulting from the heavy electrical storm.

SPILL INFORMATION

The spill volume information is summarized in Exhibit 6. There was a total of 4684 m³ of product released and 2 604 m³ reclaimed for a recovery rate of 56%.

The pie chart found in the Executive Summary shows the spillage by type of failure. In 1990, corrosion accounted for nearly 75% of the volumes released while equipment failures accounted for another 21%.

The predominant product released was crude oil (98%) with condensate accounting for most of the remaining 2%. A bar graph shown on the following page shows a comparison of the number and category of failures to the spilled volumes.

There were four failures that accounted for nearly 88% of the spilled volume. One failure alone resulted in 49% of the total spill volume.

If the 2 300 m³ spill is excluded from the data, the released volume for the remaining 35 failures is 2 384 m³, of which 2 029 m³ was reclaimed. The recovery rate for this scenario would then be 85%.

APPENDIX B

OIL PIPELINE GENERAL DATA REPORT

OIL PIPELINE FAILURE REPORT

OIL PIPELINE GENERAL DATA REPORT

CANADIAN PETROLEUM ASSOCIATION

YEAR	19																								
PIPELINE COMPANY OR SYSTEM	Name..... Address.....																								
INSTRUCTION	1. This report is for clean oil onshore pipeline systems covered by CSA Standard Z183 - Oil Pipeline Transportation Systems. 2. A separate report should be made for each operating pipeline system and forwarded to CPA within 30 days of each year end. 3. Reports by CPA member companies must be completed or reviewed for completeness by CPA Technical Committee or Pipeline Division member.																								
FAILURE	Number of Reportable Failures during recording calendar year: (A failure report must be submitted for each reportable failure)																								
VOLUME DATA	Volume of oil transported during year -LVP.....m³ -HVP.....m³ Volume - Distance during year -LVP.....m³km -HVP.....m³km																								
GENERAL SYSTEM DATA	<table> <thead> <tr> <th></th> <th>LENGTH (km)</th> <th>NUMBER OF STATIONS</th> <th>NUMBER OF PUMPS</th> <th>INSTALLED POWER (kW)</th> <th>STORAGE (M³)</th> </tr> </thead> <tbody> <tr> <td>Mainline</td> <td>.....</td> <td>.....</td> <td>.....</td> <td>.....</td> <td>.....</td> </tr> <tr> <td>Gathering</td> <td>.....</td> <td>.....</td> <td>.....</td> <td>.....</td> <td>.....</td> </tr> <tr> <td>Total</td> <td>.....</td> <td>.....</td> <td>.....</td> <td>.....</td> <td>.....</td> </tr> </tbody> </table> Total number of full time employees:		LENGTH (km)	NUMBER OF STATIONS	NUMBER OF PUMPS	INSTALLED POWER (kW)	STORAGE (M³)	Mainline						Gathering						Total					
	LENGTH (km)	NUMBER OF STATIONS	NUMBER OF PUMPS	INSTALLED POWER (kW)	STORAGE (M³)																				
Mainline																									
Gathering																									
Total																									
REPORTED BY	Name..... Date Completed..... Title..... Telephone number.....																								
CPA * MEMBER	Name..... Date Checked..... *If applicable.																								
Mall to: CANADIAN PETROLEUM ASSOCIATION 3800, 150 SIXTH AVENUE S.W. CALGARY, ALBERTA T2P 3Y7																									
Revision 02/90																									

OIL PIPELINE FAILURE REPORT

CANADIAN PETROLEUM ASSOCIATION

PIPELINE COMPANY OR SYSTEM	Sheet.....of Name..... Address..... 																									
INSTRUCTIONS	1. This report is for pipeline systems covered by CSA Standard Z183 – Oil Pipeline Transportation Systems. All data on this form will be kept confidential in accordance with request in "USE OF DATA" section. 2. A separate report should be made out for each failure and forwarded to CPA as soon as possible, but not later than 60 days after the failure. 3. A reportable failure is one in which 1.5m³ or more of oil are released; OR one in which any High Vapour Pressure (HVP) material is released; OR one in which there is an injury, a death, a fire, or an explosion. Failures during controlled testing, when using oil as the test medium, should be reported in accordance with these guidelines. 4. Zone location questions apply <u>only</u> to failures involving HVPs. 5. Reports by CPA member companies must be completed or reviewed for completeness by CPA Technical Committee or Pipeline Division Member. 6. Property damage costs reported under Failure Impact will be reported excluding product loss.																									
NOTE	Please complete all appropriate sections including "Written Account of Failure" using Typewriter or Black Ink.																									
GENERAL INFORMATION	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="4" style="text-align: center;">Date of Failure</td> <td rowspan="2" style="text-align: center; vertical-align: middle;">Commodity Released</td> <td colspan="3" style="text-align: center;">Volume Information - Cubic Metres</td> </tr> <tr> <td style="text-align: center;">Year</td> <td style="text-align: center;">Month</td> <td style="text-align: center;">Day</td> <td style="text-align: center;">Time (24 hr.)</td> <td style="text-align: center;">Released</td> <td style="text-align: center;">Recovered</td> <td style="text-align: center;">Lost</td> </tr> <tr> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> <td></td> <td style="text-align: center;">=</td> <td style="text-align: center;">+</td> <td></td> </tr> </table>			Date of Failure				Commodity Released	Volume Information - Cubic Metres			Year	Month	Day	Time (24 hr.)	Released	Recovered	Lost						=	+	
Date of Failure				Commodity Released	Volume Information - Cubic Metres																					
Year	Month	Day	Time (24 hr.)		Released	Recovered	Lost																			
					=	+																				
	Province: Nearest town: Area type: ☐ Urban ☐ Rural Spill was on: ☐ Land ☐ Water Terrain type: Zone location if applicable: ☐ Zone 1 ☐ Zone 2 Installation year of failed component 1 9 ☐ Line Pipe ☐ Pump Station ☐ Tank Farm ☐ Delivery Point																									
MAJOR CAUSE OF SPILL	Please check one only: ☐ Internal corrosion ☐ Defective pipe ☐ Equipment rupturing line ☐ External corrosion ☐ Defective weld ☐ Pipe previously damaged ☐ Operational error ☐ Equipment failure ☐ Natural hazard ☐ Other (specify):																									
ORIGIN OF SPILL	Please check as many items as required: ☐ Pipe ☐ Scraper trap ☐ Valve ☐ Meter ☐ Seam weld ☐ Welded fitting ☐ Pump ☐ Prover ☐ Girth weld ☐ Bolted fitting ☐ Tank ☐ Strainer ☐ Other (specify):																									

DETECTION OF SPILL	Outside Party ☐ Pipeline Employee ☐ Row Surveillance ☐ Leak Detection System ☐										
	Was Leak Detection System in operation Yes ☐ No ☐										
	If yes, describe mode of operation										
	Time from failure to detection of failure.....Hours.....Minutes										
FAILURE IMPACT	Number of Injuries		Number of Deaths		Fire		Explosion		Area Damaged (hectares)		
	Employees	Others	Employees	Others	☐ Yes ☐ No		☐ Yes ☐ No		Pipeline	Others	
	Clean up Costs		Property Damage Costs				Clean-up Time		Duration of System Shutdown		
	\$		\$ Pipeline		\$ Others		Days		Days	Hours	
IF FAILURE OCCURRED IN PIPE	Pipe Diameter mm		Pipe Wall Thickness mm		Specification and Grade		Type of Seam Weld		Type of Girth Weld		Metallurgical Report Done? ☐ Yes ☐ No
	Depth of Cover if Below Ground cm		Configuration at Point of Failure ☐ Straight ☐ Sag Bend ☐ Side Bend ☐ Overbend				Type of Coating		Condition of Coating		Size of Failure Major Dimension mm
	Allowable Operating Pressure kPa	Pressure at Time and Location of Failure kPa		Date of Last Pressure Test			Distance to Nearest Valve		Evidence of Brittle Fracture? ☐ Yes ☐ No		Flowrate at Time of Failure m³/h
				Y	M	D	Upstream km	Downstream km			
IF CORROSION	☐ Internal ☐ External		If Internal, was Inhibitor Used ☐ Yes ☐ No		If External, was System under Cathodic Protection? ☐ Yes ☐ No		Type of Cathodic Protection		Appearance of Failed Facility		
IF EQUIPMENT RUPTURING LINE	Type of Equipment and Activity Causing Failure		Was Equipment Operator Aware of Pipeline? How? ☐ Yes ☐ No		Was Pipeline Aware of Equipment Activity? How? ☐ Yes ☐ No		Was One-Call System in Operation? ☐ Yes ☐ No				
	Frequency and Type of ROW Surveillance at Failure Location			Did Failure Occur at Time of Damage? ☐ Yes ☐ No		If Previous Damage, How Long Between Damage and Failure?			Distance to Nearest Warning Sign m		
WRITTEN ACCOUNT OF FAILURE	Include a brief written account of the failure with any special details, recommendations that may prevent similar failures, or information that may assist Standard and Code writing bodies. (Other written reports of the failure may be attached.)										
USE OF DATA	Please Check One Only: ☐ Data on this form must be restricted to use by CPA only. ☐ Data on this form may be reviewed by CSA Z-183 Technical Committee.										
REPORTED BY	Name..... Date Completed..... Title..... Telephone number.....										
CPA * MEMBER	Name..... Date Checked..... *If applicable.										
Mail to: CANADIAN PETROLEUM ASSOCIATION 3800, 150 SIXTH AVENUE S.W. CALGARY, ALBERTA T2P 3Y7											
Revision 02/90											

APPENDIX C

1990 OIL PIPELINE PERFORMANCE REVIEW

PARTICIPATING PIPELINES

**CANADIAN PETROLEUM ASSOCIATION
1990 OIL PIPELINE PERFORMANCE REVIEW
PARTICIPATING PIPELINE SYSTEMS**

ALBERTA ENERGY COMPANY LTD.

- Alberta Oil Sands Pipeline
- Cold Lake Bitumen Blend
- Cold Lake Condensate Line
- Redwater Pipeline

AMOCO CANADA PETROLEUM COMPANY LTD.

- Alberta Ethane Gathering System Ltd.
- Aurora Pipe Line Company
- Cochin Pipe Lines Limited
- Amoco Cochrane - Edmonton Pipeline
- Empress - Kerrobert Pipeline
- Rangeland Pipe Line Company
- NGL Pipeline Ltd. (EDS North)
- Sarnia Downstream Pipeline

BP RESOURCES CANADA LIMITED

- Chauvin Pipeline / Red Earth

ESSO PETROLEUM CANADA

- Quebec South Shore Pipe Line
- Sarnia Products Pipe Line
- Winnipeg Pipeline Company Limited

ESSO PETROLEUM CANADA - IMPERIAL PIPELINE COMPANY LIMITED

- Excelsior / Fairydell Crude System
- Leduc Crude System
- Acheson / Ellerslie System
- Redwater Propane System
- Alberta Butane System
- Edmonton-Sundre Crude Line
- Judy Creek Condensate Pipeline
- Nisku Products Pipeline Company Limited

ESSO RESOURCES CANADA

- Bonnie Glen / Wizard Lake
- Bonnie Glen Crude System
- Bonnie Glen / Rimbey
- Bonnie Glen / Calmar
- Quirk Creek Pipeline

GULF CANADA CORPORATION

- Gulf Alberta Pipeline
- Valley Pipe Line
- Rimbey Pipeline Co. Ltd.
- Fort Saskatchewan Pipeline

GULF CANADA RESOURCES LIMITED

- Wabasca River Pipeline

HOME OIL COMPANY LIMITED

- Cremona Pipe Line Division
- Federated Crude System
- Federated NGL System
- Manyberries Pipe Line

HUSKY OIL OPERATIONS LTD.

INTERPROVINCIAL PIPE LINE COMPANY

INTERPROVINCIAL PIPE LINE COMPANY (NW)

MOBIL OIL CANADA

- Rainbow Pipe Line Company Ltd.
- South Saskatchewan Pipe Line Company

MONTREAL PIPE LINE LIMITED

MURPHY OIL COMPANY LTD.

- Bodo Pipeline
- Cactus Lake Pipeline
- Milk River Pipeline
- Wascana Pipeline Ltd.
- Manito Pipelines Ltd.

NORCEN ENERGY RESOURCES LIMITED

- Manitoba Pipeline
- B.C. Pipeline
- Joarcam
- Saskatchewan Pipeline
- Golden Pipeline

NOVA CORP PIPELINES LTD.

- Tanghe Creek Condensate
- Porcupine Hills Pipeline

NOVA CORP CHEMICAL LTD.

- Alberta Gas Ethylene

PEACE PIPE LINE LTD.

PEMBINA PIPELINE

PETRO-CANADA PRODUCTS

- Alberta Products Pipe Line Ltd.
- Saskatoon Pipeline

PETRO-CANADA RESOURCES

- Petroleum Transmission Company

PRODUCERS PIPELINE INC.

- Producers / Westspur Pipeline
- Stony Beach Pipeline

SUN-CANADIAN PIPE LINE COMPANY LIMITED

SUN PIPE LINE COMPANY

SUNCOR INC.

- Blueberry Taylor Pipeline
- Ft. McMurray to Edmonton Oil Pipeline

TRANS MOUNTAIN PIPE LINE COMPANY LTD.

TRANS MOUNTAIN ENTERPRISES OF B.C.

TRANS-NORTHERN PIPELINES INC.

UNOCAL CANADA LIMITED

WESTCOAST PETROLEUM LTD.